Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Unlicensed Use of the 6 GHz Band	)	ET Docket No. 18-295
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183

REPLY COMMENTS OF TUCSON ELECTRIC POWER COMPANY AND UNS ELECTRIC, INC.

Jennifer Deese
Attorney for Tucson Electric Power Company and UNS Electric, Inc.
Address: 88 East Broadway Blvd
Tucson, Arizona 85701
Email: JDeese@tep.com
Phone: 520-917-8792

Susan Gray
Senior Vice President & Chief Operating Officer

Ana Bustamante
Senior Director
Transmission & Distribution Engineering

`

March 18, 2019

Table of Contents

I. SUMMARY

Pursuant to sections 1.415 and 1.419 of the Federal Communication Commission's ("Commission") Rules,[1] Tucson Electric Power Company ("TEP"), jointly, with its affiliate company, UNS Electric, Inc., ("UNS Electric"), collectively referred to as the "Company,"[2] respectfully submits reply comments in response to the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned proceeding. [3]

After careful review of the comments filed in the NPRM, the Company reaffirms its opposition to opening the 6 GHz band for unlicensed use.[4] The Company supports the comments of the electric power industry,[5] critical infrastructure providers,[6] transportation professionals,[7] telecommunications carriers,[8] respected spectrum managers,[9] and the entire public safety

---

[1] 47 C.F.R. § 1.415 (1987); 47 C.F.R. § 1.419 (2011).

[2] UNS Energy Corporation ("UNS Energy") is the parent company of TEP and Unisource Energy Services ("UES"). UES is the parent company of UNS Electric, Inc. UNS Energy is a subsidiary of Fortis Inc., the largest investor-owned electric and gas distribution utility in Canada.

[3] *See* Unlicensed Use of 6GHz Band, 83 Fed. Reg. 64506-01 (proposed Oct. 24, 2018) (to be codified at 47 C.F.R. pt. 15) ("NPRM"); Expanding Flexible Use in Mid-Band Spectrum Between 3.7 & 24 GHz, 32 F.C.C. Rcd. 6373 (adopted Aug. 3, 2017) ("NOI").

[4] Tucson Electric Power Company, Comment to NOI (Oct. 2, 2017), https://www.fcc.gov/ecfs/filing/1002809323040 ("TEP NOI Comments"); Tucson Electric Power Company & UNS Electric, Inc., Comment to NPRM (Feb. 15, 2019), https://www.fcc.gov/ecfs/filing/10215849209899 ("TEP Comment to NPRM").

[5] Southern Co. Serv., Comment to NPRM (Feb. 15, 2019), https://www.fcc.gov/ecfs/filing/1021622230465 ("Southern Co. Comment to NPRM"); Util. Tech. Council, et. al., Comment to NPRM (Feb 15, 2019), https://www.fcc.gov/ecfs/filing/10215631615474; Xcel Energy Serv., Comment to NPRM (Feb. 15, 2019) https://www.fcc.gov/ecfs/filing/10215304262991; Idaho Power Co, Comment to NPRM (Feb. 14, 2019) https://www.fcc.gov/ecfs/filing/102141820826870 ("Idaho Power").

[6] Critical Infrastructure Coal., Comment to NPRM (Feb. 15 2019), https://www.fcc.gov/ecfs/filing/10215182624254.

[7] Ass'n of American R.Rs, Comment to NPRM (Feb. 15, 2019), https://www.fcc.gov/ecfs/filing/10215203725232.

[8] AT&T Serv., Comment to NPRM (Feb. 15, 2019), https://www.fcc.gov/ecfs/filing/1021502928004.

[9] Nat'l Spectrum Mgmt. Ass'n, Comment to NPRM (Feb. 15, 2019), https://www.fcc.gov/ecfs/filing/1021609789309 ("NSMA Comment to NPRM").

community.[10] Each of the abovementioned industries have identified significant technical weaknesses and regulatory inconsistencies with the NPRM. Moreover, these commenters unequivocally demonstrate the high likelihood of widespread harmful interference, which will occur if the NPRM is ultimately adopted. As stated in the Company's original comments, there could be undeniable negative outcomes, affecting the safety of life, health and property of the public that will result from such interference and associated outages.[11] As such, the Company again urges the Commission to not allow unlicensed operations at 6 GHz.

Further, all commenters opposed of this NPRM, agree if additional 6 GHz unlicensed use is allowed, such operations must be: (1) at a significantly-reduced equivalent isotropically radiated power (EIRP); (2) must be under the control of an automatic frequency coordination (AFC) system at all times; and (3) such AFC system must employ protection criteria consistent with the established regulatory requirements for Part 101 receivers under §101.105(a)(5)(i) & (b)[12] of the Commission's rules.

The Company strongly believes the public interest would harmed if the 6 GHz band were opened as proposed. Equally, the Company is deeply concerned that access to the 6 GHz band for unlicensed use has been portrayed as the *sine qua non* for a host of technological innovations and increased access to broadband. However, in fact there have been continuous, vibrant technological innovations for all wireless use cases, across all frequency bands, under both unlicensed and

[10] City of N.Y., Comment to NPRM, (Feb. 15, 2019) https://www.fcc.gov/ecfs/filing/1021575301313; City of Los Angeles, Comment to NPRM (Feb. 15, 2019) https://www.fcc.gov/ecfs/filing/10215192995669; (Feb. 15, 2019) Gov't Wireless Tech. & Commc'n Ass'n, et. al, Comment to NPRM (Feb. 15, 2019), https://www.fcc.gov/ecfs/filing/1021537432207.
[11] TEP Comment to NPRM, *supra* note 4, at 7-8.
[12] 47 C.F.R. § 101.105 (2005).

licensed frameworks. Additionally, and perhaps most importantly, there are long-standing licensed and unlicensed broadband spectrum options available under the Commission's existing rules for 5G and other new technologies that have not been fully utilized. Further, recent actions by the Commission have made substantial greenfield spectrum available for lightly-licensed applications.[13] It also appears the Commission may consider making an unprecedented 21.2 GHz of spectrum available for unlicensed use.[14] The aggregate non-6 GHz spectrum for existing, new, and proposed broadband use, both licensed and unlicensed, is insignificant compared to the amount of spectrum assigned to incumbent 6 GHz use. For proponents to state that all modernization and economic growth hinges solely upon unlicensed access to 6 GHz is not supported. Furthermore, the shear amount of spectrum available elsewhere will be the key to further technological innovation and increased access to broadband for American households and businesses, not the 6 GHz band.

Conversely, there is no other spectrum available to the electric power industry, critical infrastructure, national transportation, or state and local governments, whose crucial communications are needed to serve the public.[15] If these entities' operations at 6 GHz are compromised, the consequences to their systems are immediate and their ability to serve the public is also immediately impaired. Yet, mitigation of unlicensed interference will be difficult and with likelihood of resolution far from certain. Therefore, it is imperative that there be guaranteed

[13] 47 C.F.R. §30.7 (2016); 47 C.F.R.§96.11 (2015); 47 C.F.R. §§101.1501-1527.
[14] *See* Pai, Ajit, *Behold the Ides of March*, FCC BLOG (Feb. 21, 2019), https://www.fcc.gov/news-events/blog/2019/02/21/behold-ides-march.
[15] As stated in Tucson Electric Company's comments, the 6 GHz band is the only band with the propagation characteristics and required protection under Part 101. *See* TEP Comment to NPRM, *supra* note 4.

mechanisms which will prevent interference to Part 101 users *a priori* rather than rely on *post hoc* remedies.

Finally, the Company agrees with Southern Company Services that "proponents of unlicensed devices should not expect the interference criteria in Part 101 to be relaxed, especially for devices that will operate on a secondary, noninterference basis,"[16] and that if a cost-benefit analysis by the proponents of unlicensed 6 GHz use determine that the costs of compliance with established Part 101 protection criteria "are too high, then the FCC should terminate this docket without action."[17]

II. THERE ARE ROBUST SPECTRUM ALTERNATIVES FOR BROADBAND WIRELESS GROWTH OTHER THAN 6 GHZ

Throughout this proceeding and the predecessor NOI, there has been a recurring statement that "there is insufficient radio spectrum in the existing unlicensed bands to enable innovation to stay ahead of rising consumer demand."[18] This is demonstrably untrue.

The 850 MHz of spectrum sought for co-channel unlicensed use for the proposed U-NII- 5 and 7 bands that today is heavily utilized by electric utilities, critical infrastructure, national transportation providers, and state and local governments for protected Part 101 across the 5.925-6.425 GHz and 6.525-6.875 GHz would represent a paltry three (3) percent increase over what is available today for 5G and other uses. If the Commission adopts its Spectrum Horizons agenda, the amount sought from Part 101 users at 6 GHz drops below two (2) percent of other available options.

[16] Southern Co. Comment to NPRM, *supra* note 5, at ii.
[17] *Id.* at iii.
[18] IEEE 802, Comment to NPRM (Nov. 16, 2018), https://ecfsapi.fcc.gov/file/121267506617/18-18-0139-08-0000-fcc-18-295-ieee-802-comment.pdf.

Contrary to popular perceptions, in addition to the U-NII bands 1-3, the Commission has made substantial spectrum available for both unlicensed and lightly-licensed use for more than a decade.[19] This, along with the recent greenfield 150 MHz of CBRS spectrum, the new 600 MHz of Shared Coordinated Service bandwidth available at 37 GHz,[20] as well as the Commission's recent Spectrum Horizon's announcement,[21] potentially making an unprecedented 21.2 GHz of additional spectrum available for unlicensed use, makes it hard to see how low-cost or free access to minimally-regulated spectrum has been in any way "insufficient," or hindered innovation, or is likely to any time soon.

[19] Third Memorandum and Order, F.C.C. Rcd 10515 (17), Docket No. 94-124 (adopted May 8, 2000), https://www.fcc.gov/document/amendment-parts-2-and-15-commissions-rules-permit-use; Part 15 Rules for Unlicensed Operation in the 57-64 GHz Band, 28 F.C.C. Rcd 12517 (15) (released Aug. 9, 2013) https://docs.fcc.gov/public/attachments/DA-13-2403A1.doc.
[20] 47 C.F.R. § 30.7 (2016).
[21] FCC Proposed to Open Spectrum Horizons Above 95 GHz for New Services and Technologies, (released Feb. 22, 2018) https://www.fcc.gov/document/fcc-proposes-open-spectrum-horizons-new-services-technologies.

An overview of this non-6 GHz spectrum shows:

Operating Band	Common Name	FCC Rule Section	Regulatory Framework	Bandwidth Available	Primary Application(s)	Spectrum Status
2.4-2.4835 GHz	2.4 GHz	Part 15	Unlicensed	83.5 MHz	Indoor PtMP Outdoor PtMP	Heavy Use
3.55 - 3.7 GHz	CBRS	Part 96	Lightly Licensed	150 MHz	Outdoor PtMP	Greenfield
5.15-5.25 GHz	U-NII-1	Part 15	Unlicensed	100 MHz	Indoor PtMP Outdoor PtP Outdoor PtMP	Medium Use
5.25-5.35 GHz	U-NII-2A	Part 15	Unlicensed	100 MHz	Indoor PtMP Outdoor PtMP	Heavy Use
5.470-5.725	U-NII-2C	Part 15	Unlicensed	255 MHz	Indoor PtMP Outdoor PtMP	Medium Use
5.725-5.85 GHz	U-NII-3	Part 15	Unlicensed	125 MHz	Indoor PtMP Outdoor PtP Outdoor PtMP	Heavy Use
37-37.6 GHz	Shared Coordinated Service (Millimeter Wave)	Part 30	Lightly Licensed	600 MHz	Indoor PtMP Outdoor PtP Outdoor PtMP	Greenfield
57-71 GHz	60 GHz	Part 15	Unlicensed	14,000 MHz	Indoor PtMP Outdoor PtP	Widely Available
70/80/90 GHz	Millimeter Wave	Part 101	Lightly Licensed	12,900 MHz	Outdoor PtP	Widely Available
92-95 GHz	Millimeter Wave (unlicensed)	Part 15	Unlicensed	7,000 MHz	Indoor PtMP	Widely Available
116-123 GHz 174.8-182 GHz 185-190 GHz 224-246 GHz	Spectrum Horizons	Part 15 (Proposed)	Unlicensed	21,200 MHz (Proposed)	Indoor PtMP Outdoor PtP	Greenfield (Proposed)

there is more than 28,314 MHz of unlicensed or lightly-licensed spectrum available today, much of which is underutilized or completely greenfield. Further, there is an additional potential 21,200 MHz of greenfield spectrum coming on line soon under the Commission's Spectrum Horizons initiative, together with the possibility of additional access of up to 500 MHz of new spectrum in the 3.7-4.2 GHz band.

Qualcomm, Inc. made an especially compelling and eloquent showing in its recent March 6, 2019 *ex parte* meeting with the Commission's Wireless Telecommunications Bureau and Office

of Engineering and Technology. Qualcomm plainly demonstrated the multiple bands available to 5G applications,[22] of which 6 GHz was a small fraction of the numerous options, available for 5G spectrum sharing, both now and likely well into the future.

Therefore, given the objective evidence establishing other viable and abundant spectrum options, the Company submits the notion that unlicensed access to the 6 GHz is the limiting factor slowing innovation, the deployment of 5G, or increasing broadband availability to rural America is completely dispelled and discredited. Rather, instead of the lack of spectrum options, users seeking unlicensed spectrum seem to have abundant availability. Compare this with the electric utilities, critical infrastructure, national transportation, and state and local governments, all whom have fewer reliable spectrum options to perform their vital public service functions. A compelling case could be made that with so much unlicensed spectrum long underutilized, and the greenfield spectrum like CBRS not yet online, that the continued push for additional unlicensed frequency assignments over other uses vital to society is tantamount to spectrum hoarding that is clearly not in the public interest - especially if 6 GHz becomes unreliable for incumbent uses as a result of unlicensed co-channel use as is widely anticipated.

III. THE RECORD IS UNCONVINCING THAT 6 GHZ USERS WILL BE ADEQUATELY PROTECTED

There is nothing in the record, based upon actual evidence, that persuasively supports the conclusion that unlicensed spectrum at 6 GHz can be shared as proposed without causing harmful interference to existing incumbents.

[22] *See* Qualcomm, Inc., *Ex parte* Presentation to NPRM, (Mar. 8, 2019) https://ecfsapi.fcc.gov/file/1030814462775/3-8-2019%20Qualcomm%20Ex%20P%20re%20NR%20U%20SS.pdf at 4.

As observed by the Utilities Technology Council ("UTC"), the Edison Electric Institute ("EEI"), the American Public Power Association ("APPA"), the National Rural Electric Cooperative Association ("NRECA") the American Petroleum Institute ("API"), and the American Water Works Association ("AWWA"), the automated frequency coordination ("AFC") system "is a purely conceptual approach that has not been proven to perform as promised."[23] Further, these entities comment that "the proposed AFC system is based upon false assumptions and inaccurate data about incumbent microwave systems in the band; and it does not account for sources of passive reflection and multipath fading that can increase the potential for interference."[24]

The Company strongly agrees with this assessment, and notes that while there are many constructive comments in the proceedings by electric utilities, critical infrastructure providers, the Fixed Wireless Communications Coalition (FWCC), the transportation industry, the entire public safety community, and individual state and local governments to improve the functionality and protections of the AFC system, none of these commenters express any confidence that such a system - even incorporating all of the suggested improvements - will actually provide adequate protection to Part 101 receivers. Rather, all comments highlight the fact that such an approach is completely unproven, with the National Spectrum Management Association (NMSA), observing "this untried approach represents a potential danger to national security, public safety, health and welfare which the Fixed Service (FS) links support."[25]

[23] UTC Comment to NPRM, *supra* note 5.
[24] *Id.* at i.
[25] NSMA Comment to NPRM, *supra* note 9.

IV. HIGH-GAIN ANTENNAS AND STANDARD-POWER UNLICENSED 6 GHZ OPERATIONS ARE NOT JUSTIFIED

Despite the Commission's apparent intentions to prohibit high-EiRP unlicensed 6 GHz operations,[26] as the Company observed in its original comments in the NPRM, ambiguity in the Commission's language relating to limitations on high-power unlicensed 6 GHz operations could be interpreted to allow for such operations.[27] Several commenters have also discussed this ambiguity, to propose the use of high-power unlicensed operations at 6 GHz, well beyond what the Commission originally proposed in the NPRM.[28]

The Company reiterates if the Commission proceeds with this NPRM, it should not only prohibit high-gain, directional antennas for unlicensed use at 6 GHz, but also that all access points across should be limited to low-power operation only, under the positive control of a single AFC system.[29] The rationale extends beyond protecting incumbent primary users, but also recognizes the stewardship required, to ensure unlicensed emitters do not transmit at an EiRP exceeding the reasonable level needed to conduct the intended wireless communications. The Commission needs to encourage the adoption of recent technology innovations that allow for lower transmit power levels and higher modulation rates. This will permit frequency reuse, while avoiding polluting the 6 GHz band for all uses, including unlicensed applications, as has occurred in the existing U-NII

[26] NPRM, *supra* note 3, at ¶ 79.
[27] TEP Comment to NPRM, *supra* note 4, at n.61.
[28] Dynamic Spectrum Alliance, Comment to NPRM (Feb. 19, 2019), https://ecfsapi.fcc.gov/file/1021610035633/DSA%206%20GHz%20Comments.pdf; Cambium Networks, Ltd., Comment to NPRM (Feb. 15, 2019), https://ecfsapi.fcc.gov/file/1021668507162/Cambium%20comments%20on%20FCC%2018-147%20(FINAL)%20%20-%20Copy.pdf; Apple Inc., et. al, Comment to NPRM (Feb. 15, 2019) https://www.fcc.gov/ecfs/filing/10216633127609 ("6 GHz RLAN Group"); Hewlett Packard Enterprise Co., Comment to NPRM (Feb. 15, 2019), https://ecfsapi.fcc.gov/file/10216284989851/HPE%206%20GHz%20Comments%202.15.19.pdf.
[29] TEP Comment to NPRM, *supra* note 4.

bands through the use of spectrally-inefficient, high-EiRP operations that employ unsophisticated modulation schemes.

Referencing the RKF Technical Study, the technical foundation of most of the unlicensed proponents' showing that unlicensed uses can coexist with incumbent 6 GHz uses, the study clearly predicts a "conservative ratio for indoor vs. outdoor RLANs in all sub-markets of 98% and 2% respectively."[30] Therefore, it is reasonable and appropriate to focus the NPRM toward maximizing the use of indoor unlicensed communications that will comprise 98 percent of the anticipated use cases at 6 GHz.

Given that there are other viable options for providing outdoor wireless broadband, both lightly-licensed and unlicensed, the Company submits outdoor operation of unlicensed 6 GHz should be prohibited.[31] Considerable effort and expense will be required of the AFC system and unlicensed operators for the marginal 2 percent of the use cases where superior spectrum options already exist. Yet it is these marginal uses that are likely to absorb significant amounts of time and resources to resolve any interference that is likely to occur.

Second, where the Commission suggests in the NPRM that "the ITU model shows a median [entry loss] of approximately 18 dB for traditional construction and 30 dB for thermally-efficient

[30] RKF Engineering Serv. LLC, *Frequency Sharing for Radio Local Area Networks in the 6 GHz Band* (Jan. 2018), Letter to NOI, Apple, Inc., *et al*. (filed Jan. 26, 2018) at 14 https://ecfsapi.fcc.gov/file/101261169015803/6%20GHz%20Ex%20Parte%20(Bureaus).pdf ("RKF Study").

[31] The Company argues that since there is a small percentage of outdoor unlicensed 6 GHz operations anticipated by proponents, together with the fact that outdoor access points are the operations most prone to cause direct harmful interference to incumbent users, such use should be prohibited.

construction,"[32] other commenters notate the typical attenuation levels are actually between 30 and 40 dB.[33]

Conversely, the Friday Institute for Education Innovation, at North Carolina State University, convincingly describes how North Carolina public schools have found the masonry interior of many of their legacy buildings were not permeable to RF energy for their Wi-Fi requirements, and discovered that by using more lower power access points at 5 GHz, over choosing higher-powered operations, co-channel interference is actually reduced, while achieving the client density required in classrooms and allowing for the use of larger channel sizes.

Given the similarity in propagation of both the 5 and 6 GHz bands, the Company's comments above demonstrate here is little, if any, marginal benefit to unlicensed users from high-power or even standard-power operations. Unlicensed EiRP levels sufficient to overcome a 40 dB or even a 20 dB transmission loss can never be justified. Therefore, with 98 percent of unlicensed 6 GHz expected to occur indoors, inside buildings with significant Faraday shielding effects, there is little technical justification for even operating at the standard-power levels.

Instead, low-power access points should suffice for the overwhelmingly majority of the use cases, deploying multiple low-power access-point devices where increased coverage is desired as the North Carolina public schools have accomplished at 5 GHz while also increasing throughput. This, in turn, will contribute both to increased protections to incumbent 6 GHz users, while avoiding pointless pollution of the band for unlicensed applications now and into the future. Low-power use will dramatically increase the opportunities for frequency reuse, thus helping achieve

[32] NPRM, *supra* note 3, at ¶ 70.
[33]Leading Builders of Am., Comment to NPRM (Feb. 15, 2019), https://ecfsapi.fcc.gov/file/1021496728775/%20021419-Leading_Builders_of_America_6GHz-Comments.pdf; 6 GHz RLAN Group, *supra* note 31, at 127 Appendix E.

the other important Commission goal of enhancing "spectrum access, management, and use so as to maximize the availability of broadband."[34]

V. 6 GHZ UNLICENSED POINT-TO-POINT USE SHOULD BE PROHIBITED - THERE ARE OTHER OPTIONS

Similar to proposals for high-EiRP operations, multiple commenters seek to use the 6 GHz band for point-to-point unlicensed operations.[35]

The Company submits that this is not only infeasible from a technical standpoint, it would create an inconsistent, unfair, and unwise regulatory framework where an applicant who is unable to obtain new primary 6 GHz frequency assignments via the prior coordination notice (PCN) process could, using the alternate AFC protection criteria proposed, obtain a similar frequency assignment for the same operations that are impermissible under the established TSB-10 criteria, causing harmful interference or at least a significant erosion of the fade margin that the Part 101 users rely upon.

For instance, point-to-point links generally provide critical backhaul circuits between access points, point-to-multipoint broadband base stations, and/or fixed facilities to the corporate network, ISP or Internet, whether they are licensed or unlicensed. As such, they are of high value to the user's network with more thought and investment typically dedicated to their implementation compared to an access point or other edge device.

Given the myriad of point-to-point options available: unlicensed at U-NII bands 1 & 3, and at 60 GHz, together with lightly-licensed options at 70/80/90 GHz, combined with Part 101

---

[34] F.C.C., Strategic Plan 2018-2022, at 6, https://docs.fcc.gov/public/attachments/DOC-349143A1.pdf.

[35] Ubiquiti Networks, Inc., Comment to NPRM (Dec. 21, 2018), https://www.fcc.gov/ecfs/filing/1222288115327.

licensed options at 6, 11, 18, 23, 31 and 38 GHz, it is highly likely, that a point-to-point user could find many viable spectrum alternatives to high-EiRP unlicensed operations at 6 GHz. As such, the Company submits that unlicensed access to 6 GHz for unlicensed point-to-point communications is not limiting this use case.

Additionally, the Commission should be mindful that in most metropolitan and many suburban areas telcos, cable companies, and other commercial providers can provide high-bandwidth, circuits for a fee. Today, these wireline offerings can provide much higher bandwidth than is possible any wireless technology. From a technical perspective, users needing point-to-point communications have many other options and the Commission should actively encourage these users to seek them out.

VI. NO MOBILE AND ESPECIALLY NO UAV/DRONE USE OF 6 GHZ SHOULD BE PERMITTED

While the Commission appears to close the door to utilizing unlicensed access points in moving vehicles such as cars, trains, or aircraft in the NPRM, the Company notes several commenters propose allowing these type of mobile and airborne operations.[36] The Commission should reject all such proposals and ensure there are strong, unambiguous, and definitive regulatory prohibitions and technical impediments to such unlicensed 6 GHz use.

The Commission acknowledges in the NPRM that there are "interference consequences of allowing operation onboard aircraft because the longer line-of-sight distances from devices at typical aircraft altitude could result in interference over a wide area."[37] In addition to such

[36] Small UAV Coal., Comment to NPRM (Feb. 15, 2019), https://www.fcc.gov/ecfs/filing/1021500037080; Ass'n for Unmanned Vehicle Sys. Int'l, Comment to NPRM, (Feb. 15, 2019), https://ecfsapi.fcc.gov/file/10215315013913/Comments%20of%20AUVSI.pdf.

[37] NPRM, *supra* note 3, at ¶ 84.

consequences, the Commission also needs to recognize the additional implications with allowing unlicensed 6 GHz mobile, vehicular, and airborne use.

With increasing and alarming regularity, unmanned aircraft vehicles ("UAV"), particularly drones, are being used to disrupt air travel, introduce contraband into prisons,[38] and attempt to infiltrate and surveil military installations.[39]

Understandably neither the Commission, nor commenters want to facilitate illegal activity. However, it must be presumed that anyone engaging in such unlawful acts will seek to access whatever means are available to them, with little care for any rules or restrictions flowing out of the NPRM -- or who they may harm in the process, in accomplishing their illicit activities.

The explosive growth in UAV/drones, and their consequent use for illegal purposes, has led affected facilities and agencies to develop strategies to thwart such activities, including the use of electronic countermeasures that target the operating frequencies used to control these drones, with the potential use of high-power jamming equipment. It remains to be seen whether such radiofrequency countermeasures will become ubiquitous, but it is reasonable to expect a future where countermeasures will be more intensely deployed.

The Company's concern here is that necessary electronic countermeasures, particularly radiofrequency jamming, have a high likelihood of causing harmful interference to incumbent 6 GHz Part 101 receivers, even if the operation of the drone itself causes no harm. Given the extremely high EiRP of jamming equipment and the high-gain antennas employed, such activities

[38] National Public Radio, *Prisons Work To Keep Out Drug-Smuggling Drones* (Nov. 15, 2017), https://www.npr.org/2017/11/15/564272346/prisons-work-to-keep-out-drug-smuggling-drones.
[39] The Wall Street Journal, *Weapon Makers Declare War on Drones* (Mar. 3, 2019), https://www.wsj.com/articles/weapons-makers-declare-war-on-drones-11551627000.

have the potential to affect Part 101 receivers many miles distant from any incident, requiring the electronic countermeasures.

The Company does not suggest that affected facilities and agencies stop or reduce their efforts to address illegitimate drone operations. The Company asserts that these impacts can be virtually eliminated, if the Commission maintains: (1) a strict prohibition on mobile 6 GHz unlicensed use, (2) requires all access points to be under the positive control of the AFC; (3) and prevents the manufacture, import or use of unlicensed equipment with changeable antennas or external antenna connections. By doing so, any countermeasures required, will likely not include the 6 GHz band, and thus are much less apt to impact incumbents' operations.

In the case of legitimate drone operations, multiple narrowband options exist, both licensed and unlicensed, for telemetry and aircraft control requirements. Where drone operators desire broadband access, the ISM and U-NI-I bands 1 – 3 are available at no cost for unlicensed applications, with additional fee-based service available through wireless carriers.

As to the use cases for portable access points operating in terrestrial automobiles and other vehicles, the Company notes the growing prevalence of such applications, but as the Commission has recognized, protecting incumbent 6 GHz from mobile or nomadic operations will likely be impossible. Here, the Company submits that further efforts in allowing mobile unlicensed use not only are unlikely to succeed, they are wholly unwarranted. Access points providing broadband access within a vehicle are essentially personal area networks ("PANs") that only need to provide connectivity within a few meters. Here, the adjacent U-NI-I bands 1 – 3 or 60 GHz should provide robust interference-free broadband communications for any conceivable vehicular use. Given both the short range required, the nomadic nature of the vehicle itself, along with the shielding and attenuation provided by the vehicle's metal body and glass, there will continue to be a plethora of

unlicensed broadband communications options for in-vehicle use for the foreseeable future – options that will be inexpensive and simple to implement, without the requirement of a complicated AFC system, convoluted calculations as to the vehicles velocity, likely area of operations, beacon fencing, etc., or herculean measures to protect licensed spectrum users. Here again, the Commission should simply prohibit mobile and in-vehicle unlicensed 6 GHz use.

VII. UNLICENSED USER ACCESS TO THE AFC NEED NOT BE BURDENSOME

Despite assertions to the contrary,[40] accessing the AFC system would not be complicated or burdensome for unlicensed users. Today, most residential and broadband users obtain internet access via some sort of an automatic IP addressing mechanism, like dynamic host configuration protocol ("DHCP") or other assignment mechanism that is periodically refreshed. Further, in many corporate or commercial WiFi implementations, frequency assignments for access points are determined via a centralized control mechanism. Therefore, utilizing these existing mechanisms for IP address assignments and authentication, can easily be adapted to include what will also be an automated process to access the AFC. This will result in a combined session request from the access point that can establish or renew both its IP address assignment and its AFC frequency authorization at the same time. Considering that neither broadband wireless service nor internet access will be possible without both an IP address and a frequency assignment, this process not only should be mandated by the Commission, it is inevitable that manufacturers and service providers seek to incorporate and automate these processes in order to efficiently implement the AFC process, manage TCP/IP networks, and control user authentication.

[40] 6 GHz RLAN Group, *supra* note 31, at 64.

VIII. UNLICENSED PROPONENTS DEMONSTRATE UNFAMILIARITY REGARDING HOW PART 101 FIXED SERVICES ARE CONSTRUCTED

Suggestions that a "FS link almost never enters operation less than 30 days after Commission receipt and posting of the corresponding application to ULS"[41] are simply incorrect. Part 101 users can and do begin operations as soon as 24 hours after the Commission accepts for filing a duly-coordinated Form 601 application that has successfully gone through the PCN process. In these cases, no construction notice is filed as the frequency authorization would not have yet been granted and such construction notification would logically be impossible.

However, all such permitted Part 101 operations, whether secondary operations pending Commission approval of a related Form 601 application accepted for filing, or a primary authorization that is undergoing construction and testing have a legitimate need and expectation of protection from harmful interference by Part 15 unlicensed users.

Many systems begin transmitting and undergo testing and alignment after the Commission issues a Part 101 frequency authorization, but are not notified to the Commission as constructed until much later, when the system is definitively in service. Anyone familiar with aligning and optimizing a new fixed link can attest to the need for interference-free conditions, as defined by the protection criteria of the PCN process, to properly test and qualify a microwave link. If unanticipated co-channel transmissions were present, licensees would expend enormous amounts of time and resources needlessly troubleshooting their equipment and otherwise-sound installations, due to unanticipated interference from Part 15 co-channel activity.

As such, the requirement that the AFC system update its database from ULS and limit unlicensed access points from causing harmful interference to registered Part 101 frequency

[41] 6 GHz RLAN Group, *supra* note 31, at 42.

assignments every 24 hours is completely justified and will be crucial to the AFC system being a credible and effective mechanism to mitigate harmful interference to incumbent 6 GHz uses.

IX. SUGGESTIONS TO LIMIT AFC CAPABILITIES ARE MISGUIDED

The Commission appropriately inquires in the NPRM whether the AFC system should: (1) require registration of AFC-controlled devices; (2) direct these devices to periodically transmit a unique identifier; and (3) mandate that AFC systems log the frequencies used by AFC-controlled RLAN devices.[42] Incumbent commenters overwhelmingly and unambiguously demonstrate that these requirements are critical to having any hope that an AFC system will be viable and effective.[43]

Comments to the contrary, by unlicensed proponents, demonstrate a clear lack of understanding of how harmful interference to primary licensed authorizations is identified, located and resolved, while asking that secondary, unlicensed operations be granted protections not available to incumbent users.

For instance, the notion that requiring RLANs to transmit a unique identifier "does not provide licensees with the tools to receive it,"[44] demonstrates the lack of experience of the commenters in resolving real life cases of interference. Rarely, if ever, is the victim receiver used in directional finding efforts or even required to be able to receive or decode an over-the-air identifier. Once the presence of harmful interference is established, specialized monitoring equipment, directional antennas, and trained personnel engage in extensive field operations to locate the source of the harmful interference. It is during these mitigation efforts that the unique identifier, as proposed,

[42] NPRM, *supra* note 3.
[43] *See generally supra* note 5-10.
[44] 6 GHz RLAN Group, *supra* note 31, at 64.

will be instrumental in locating the actual culprit and resolving the interference, given the tens of thousands of likely unlicensed co-channel devices likely to be operating in a given area.

The 6 GHz RLAN Group's concern that "the Commission would need to mandate the use of a specific technology to modulate this information"… "that a licensee could use to identify the source of any interference,"[45] is exactly what the Commission should do, allowing "the identifier to be transmitted in a way that licensees could easily receive and successfully decode despite significant background noise."[46] This is no different than the Commission's requirement for land mobile operations under Part § 90.425, where neither receiver equipment nor human beings speak Morse Code, but use the international standard coding format to easily and successfully identify and distinguish authorized transmitters.[47] In its comments, the Company essentially suggested this exact same mechanism using the inherent capabilities of modern IEEE 802.11-compliant equipment via the Basic Service Set (BSS), or some other unencrypted, plaintext format that is easily to detect and identify over the air.[48]

Given the supreme confidence expressed by the unlicensed 6 GHz proponents that their proposed AFC framework will be effective in preventing harmful interference, the Company is frankly puzzled by such strong resistance to providing such a simple measure that would be critical to identifying and resolving such interference, and central to assessing post-incident damages and penalties.

Incidentally, the Company notes the 6 GHz RLAN Group's acknowledgement of the need to identify sources of interference, and appreciates how succinctly "despite significant background

[45] *Id.*
[46] *Id.*
[47] 47 C.F.R. § 90.425 (2017).
[48] TEP Comment to NPRM, *supra* note 4, at 20.

noise" recognizes that even the 6 GHz RLAN Group expects there to be a significant increase in the noise floor at 6 GHz over what is experienced today if unlicensed operations are allowed.[49]

Equally, arguments that "periodic transmission of a unique identifier would also allow every affected 6 GHz RLAN device to be tracked anywhere in the world"[50] and thus compromise the privacy of users are without merit. Currently, mobile broadband access, both commercial and unlicensed, relies heavily on the transmission of unique identifier information for network access, authentication, and operating the network infrastructure. For commercial wireless carriers, the international mobile equipment identity ("IMEI") number it is central to maintaining mobile communications. For Wi-Fi users, the subscribers' media access control ("MAC") address is a unique hardware identifier broadcast during communications with the access point. Yet both of these identifiers also allow worldwide tracking of users today.

Considering any unlicensed use of 6 GHz will also require a unique identifier and authentication mechanism for subscribers accessing access points, it is inconceivable that at 6 GHz the unique identifier requirements would create more intrusive or more anonymizing mechanisms than are in ubiquitous use at other bands, or would be more prone to compromising actual user traffic or creating network breaches. Any vulnerabilities to sensitive user information or content transmitted would be strictly a function of the network security and protocols employed, and would have nothing to do with either the operating band or the use of an AFC system.

The Company notes that 6 GHz licensed incumbents' contact and operational information are all a matter of public record in ULS, accessible to anyone around the world. Nonetheless, Part 101 incumbents, many of whom conduct very critical and sensitive communications using these

[49] 6 GHz RLAN Group, *supra* note 31, at 65.
[50] *Id.*

networks, have been able to operate securely and reliably for decades with this level of transparency.

Yet, those who oppose unique identifiers for unlicensed use, all of which will be secondary operations to incumbents, are suggesting that a different standard apply, concealing the point-of-contact information for these secondary users who will then be almost impossible to specifically identify or contact when trying to resolve interference.

X. ECONOMIC COSTS OF OPENING 6 GHZ TO UNLICENSED USE HAVE NOT BEEN ADEQUATELY EXAMINED

The Company adamantly disagrees that additional unlicensed RLAN operations are the only realistic option for increasing use of the band or that these RLAN devices are in any way "complementary," as suggested by other commenters.[51] New proposed Part 15 entrants would operate under rules that are unjustifiably permissive and potentially spectrally inefficient, threatening not only licensed incumbents who are fully utilizing the band today, but also assuredly crowding out a vibrant, innovative, and economically-important ecosystem of unlicensed users who have pioneered low-power mechanisms to provide ultra-wideband communications (UWB) while harmoniously coexisting today with primary, protected 6 GHz uses.

The IEEE 802 Committee acknowledges the intractability of this problem stating "[c]urrently no obvious resolution to the difference in power levels in the same band and IEEE 802 is aware that resolution to this problem must be determined."[52]

These new entrants would not only access the 6 GHz spectrum for free, they would bear none of the costs of the value destruction to existing unlicensed low-power ecosystem. Equally, these

[51] 6 GHz RLAN Group, *supra* note 31, at 2.
[52] IEEE 802 LAN/MAN Standards Committee, Comment to NPRM (Dec. 12, 2018) https://www.fcc.gov/ecfs/filing/121267506617.

new entrants would escape the costs for any damage to the operations and/or for potential relocation if incumbents are forced to abandon the 6 GHz due to the interference – incumbents who provide significant public goods and services, and costs that under the Commission's existing rules, and absent a change to the NPRM allowing for compensation, would accrue to incumbents who have a reasonable regulatory expectation of interference-free operations. Reflecting upon the above reality, it is hard to find a better example of the free rider problem that will lead to a "tragedy of the commons" as R Street Institute describes in their comments.[53]

As Idaho Power notes, the costs of finding suitable alternative means of communications would be paid for by electric utility customers and would cost upwards of 14 million dollars, for its service territory.[54] Extending this reality to other similarly-afflicted Part 101 incumbents, particularly critical infrastructure, and state and local governments, if 6 GHz becomes unreliable for incumbent uses, one unavoidable impact of the NPRM could be a de facto tax increase that, conservatively, will run into many tens of billions of dollars. Since there is no provision to compensate or offset the costs for relocating off the 6 GHz spectrum, as the Commission has historically provided in other cases of spectrum rebanding or relocation, these costs will be borne directly by taxpayers or ratepayers, as governments scramble to find alternatives to 6 GHz and have no choice but to extract required funds from their tax or rate base. In the case of utilities, as Idaho Power recognizes, these relocation costs will be paid via an indirect tax through increases in rates paid by everyday citizens and businesses, consuming electricity.[55]

---

[53] R Street Inst., Comment to NPRM (Feb. 8, 2019), https://www.fcc.gov/ecfs/filing/10208095281004.
[54] Idaho Power, *supra* note 5, at 6.
[55] *Id.* at 5-6.

XI. CONCLUSION

The Company appreciates the Commission's efforts in the NPRM and elsewhere to encourage innovation and make scarce spectrum resources available for all Americans. However, in this instance, the framework presented in the NPRM has serious technical flaws, as detailed in filings by the Company and other similarly-situated 6 GHz incumbents.

Proposals by the unlicensed proponents allowing for even more permissive co-channel use, at higher EiRP level and establishing even fewer protections than contemplated, should be firmly rejected.

Electric utilities, critical infrastructure and national transportation providers, together with state and local governments, have a combined experience equaling thousands of human years operating and protecting highly-complex, highly-regulated, mission-critical fixed wireless services, upon which our society and economy rely under the most varied and demanding conditions imaginable. The Commission should be informed by and avail itself of the unique and demonstrated experience of these commenters in the NPRM.

In the same vein, consistent with the Company's original comments and those herein, if the Commission moves forward with opening 6 GHz to unlicensed use, significant modifications to the proposed framework must be made, with essential, enforceable safeguards put in place to protect incumbents. At a minimum, the Commission should:

- First direct unlicensed use toward other existing unlicensed and lightly-licensed bands where spectrum has not been effectively utilized and/or is greenfield;

- Require a single, centralized AFC system that incorporates the protection criteria suggested by the FWCC and NMSA, along with the registration requirements and positive control mechanisms recommended by the Company and other incumbents;

- Require that the methodology and protection criteria of the AFC system be publicly available for inspection and evaluation;

- Prior to allowing any additional unlicensed 6 GHz use, the Commission must require an extensive period, under multiple operating conditions, that conclusively and convincingly demonstrates the AFC system will reliably and consistently prevent interference and provide protection to incumbent 6 GHz users at least equivalent to what the Commission's rules afford today;

- All unlicensed 6 GHz access points should be low power, and all should be under the positive control of the AFC system;

- All high-gain antennas, all high-EiRP unlicensed operations, and all outdoor standard-power unlicensed operations at 6 GHz should be prohibited;

- No unlicensed point-to-point 6 GHz operations should be allowed. Users should be directed to more appropriate bands for these operations;

- No unlicensed mobile 6 GHz operations should be allowed. Users have adequate options already for these use cases;

- All UAV/Drone and other airborne operations at 6 GHz should be specifically prohibited; and

- Additional effective interference protocols and enforcement mechanisms are required. Fast-track access to by utilities and critical infrastructure to the Commission's Enforcement Bureau for field enforcement action is imperative.

While opening 6 GHz to further unlicensed use is clearly not justified, in order to have any success allowing such unlicensed co-channel operations as proposed in the NPRM, the Company encourages the Commission to proceed cautiously and deliberately, adopting the mechanisms and enhancements recommended by the 6 GHz incumbents who serve the public.

Respectfully Submitted,

/ss/

Jennifer Deese
Attorney for Tucson Electric Power Company and UNS Electric, Inc.
88 East Broadway Boulevard
Tucson, Arizona 85701
Email: JDeese@tep.com
Phone: 520-917-8792

Susan Gray
Senior Vice President & Chief Operating Officer

Ana Bustamante
Senior Director
Transmission & Distribution Engineering